Results and Conclusions From Wet Cleaning Demonstration Projects

Jo Patton

Center for Neighborhood Technology

Ms. Patton is Coordinator of the Center for Neighborhood Technology's (CNT's) Sustainable Manufacturing and Recycling Program, which helps small businesses comply with environmental regulations through recycling and pollution prevention. In her current position at CNT, Ms. Patton serves as Project Manager for the Alternative Clothes Cleaning Demonstration Project, which she developed. Ms. Patton earned a B.A. in Latin American Studies from the University of Illinois-Chicago.

Introduction

In 1992, the U. S. Environmental Protection Agency (EPA) initiated a partnership with the dry cleaning industry and others to address ways to reduce exposure to perchloroethylene (perc), the solvent used by 90 percent of U.S. dry cleaners. This partnership provided a springboard for a variety of research projects on alternative technologies and substitute solvents.

One alternative identified early in this process was wet cleaning, a range of techniques and technologies that use water as the primary solvent to clean clothes labeled "dry clean only." Several of the research projects designed to evaluate wet cleaning are being conducted in real world commercial settings. This paper describes these research projects and summarizes some preliminary findings.

Center for Neighborhood Technology Research

The Center for Neighborhood Technology (CNT) is an independent, nonprofit research and technical assistance organization with a tradition of working with industry partners to find practical solutions to environmental problems. Through funding from EPA, CNT initiated the Alternative Clothes Cleaning Demonstration Project with the goal of evaluating the performance and commercial viability of wet cleaning. This CNT research project includes the design, monitoring, and evaluation of all aspects of a commercial clothes cleaning shop using only wet cleaning (called The Greener Cleaner) and data collection at two shops relying on both water and traditional dry cleaning solvents.

CNT designed The Greener Cleaner to mirror an average commercial dry cleaning operation in volume and rates as well as fabric, fiber, and garment types cleaned. The difference is that all items brought in for cleaning are wet cleaned. The shop has a wet cleaning system manufactured by Wascator in Sweden and distributed by Aqua Clean Systems, Inc. in the United States. The demonstration shop is privately owned and a lease agreement ensured CNT control of all testing and demonstration aspects of the shop's operation to carry out the research.

Evaluate the Performance of Wet Cleaning

The project gathered and compiled data regarding cleaning performance over time and with a full range of fabrics. Two test protocols were developed that address critical performance issues for tests on separate groups of garments.

The first test "Wet Cleaning: Performance on Full Range of Typically Dry Cleaned Garments" includes documentation of all garments cleaned at the shop, assessment of customer satisfaction, and intensive evaluations of a random sample of garments cleaned at The Greener Cleaner. During the course of the 12 months of research, the demonstration shop wet cleaned 31,734 items. Of those garments, 60 percent were of fabric types often labeled "dry clean only"—wool, silk, rayon, and linen.

To assess customer satisfaction, two telephone surveys of The Greener Cleaner's customers were performed by an independent survey firm. The first survey of 203 customers was conducted in November 1995, and the second, of 100 customers, was conducted

in June 1996. Results were consistent between the two surveys with 86 percent of customers rating the shop's overall service as "excellent" or "good" in the first survey and 87 percent responding positively in the second. Similarly, 85 percent of respondents in the first survey and 84 percent in the second said they would recommend The Greener Cleaner to a friend. Several questions were added to the second survey to gauge customers' knowledge of and attitude toward wet cleaning. The following question and responses indicate the extent to which environmental concerns played a part in customers' initial interest.

"Why did you first take your clothes to The Greener Cleaner?"

Concern about the environment	64 percent
Convenient location / parking	18 percent
Curious	16 percent
Other	14 percent
Reputation for quality service	11 percent

In another measurement of customer satisfaction, shop records on customers indicate a steadily increasing base of return customers. In September 1995, repeat customers represented 60 percent of total visits for the month. By April 1996, that figure was 81 percent.

The first test also included intensive evaluations by independent evaluators of a random sample of garments cleaned at The Greener Cleaner. Results of the intensive evaluations of 460 garments, conducted on the garments before and after cleaning, indicated that a majority of the garments were cleaned and finished satisfactorily. A central concern is the dimensional change noted in sample garments. Of the woven garments evaluated, 62 percent had shrinkage or stretching within the acceptable rate of 0-2 percent. Shrinkage or stretching in the range of 2-4 percent was measured in 27 percent of the woven garments, and 11 percent with over 4 percent shrinkage or stretching. Shrinkage and stretching in the knit garments was greater, with 21 percent measured with over 6 percent shrinkage and 15 percent with stretching over 6 percent.

The second test, "Comparative Analysis of Wet Cleaning and Dry Cleaning Performance After Repeated Cleanings," compares the performance of wet cleaning and dry cleaning on 52 sets of three identical garments. All the test garments specified dry cleaning in their care instructions and many were selected as likely "problem garments" for wet cleaning. In each set, one garment was wet cleaned, one dry cleaned and the third was stored and used as the control.

These garments were evaluated after being worn repeatedly and cleaned six times. In 13 sets, evaluators judged the general appearance of the dry cleaned garment to be better than the wet cleaned garment. In two sets, evaluators judged the general appearance of the wet cleaned garment to be better than the dry cleaned garment. On color change, evaluators rated seven wet cleaned garments and eight dry cleaned garments to have unacceptable color change.

As had been noted in the evaluations of customer clothes, dimensional change was far greater in knits than in woven garments for both wet and dry cleaned garments. A total of 16 dry cleaned woven garments and 15 wet cleaned woven garments had shrinkage within the acceptable 0-2 percent range. However, while there is little difference in shrinkage within this range, the difference in the upper ranges of shrinkage is significant. None of the dry cleaned woven garments had shrinkage of 6 percent or greater, while four of the wet cleaned garments did.

Monitoring Wet Cleaning Processes Under Field Conditions

Systematic observation of the shops has provided a basis for process evaluation including work flow, plant layout, water and energy use, and identifying process inefficiencies. In addition, several hundred cleaning professionals have taken advantage of the opportunity to tour the shop during business hours, watch the wet cleaning process from start to finish, and interview shop personnel.

Research on the volume and quality of water discharge from The Greener Cleaner was done in partnership with the Illinois Hazardous Waste Research and Information Center and the Metropolitan Water Reclamation District. Water testing was conducted for 3 days during which time volume was monitored and a composite sample was taken each day. Each sample underwent comprehensive lab analysis, with the following results:

- The pH of the wastewater was neutral.
- The biochemical demand was no higher than typical residential wastewater.
- The phosphorus concentration was approximately one-tenth that of typical residential wastewater.
- There were no significant concentrations of metals or toxic chemicals.

Experiences in Two "Mixed" Wet/Dry Shops

CNT is also conducting research at two other commercial sites. These are professional garment cleaning businesses in which a significant percentage of garments are wet cleaned and the remaining portions are cleaned off site in traditional dry cleaning solvents.

One of these sites is a small shop in Florida that uses two Kenmore washing machines manufactured by Sears in the United States for home use. The move to wet cleaning at Orange Blossom Garment Care was driven by necessity. When concern regarding the environmental impacts of the solvent Valclene prompted the phase out of this solvent, Orange Blossom owner Ruth Wedenburg decided to maximizes her usage of her two washing machines rather than invest in new perc or petroleum equipment. During the research period, Orange Blossom wet cleaned 43 percent of total customer garments, laundered an additional 44 percent of shirts, and had the remaining 13 percent dry cleaned off site. Seventy-seven percent of the wet cleaned garments had care instructions specifying dry cleaning.

Located in Bettendorf, Iowa, Brix Cleaners was purchased by its current owner in January 1996. They use the Aquatex system developed by JLS with the washer / extractor manufactured in Belgium by IPSO and the dryer manufactured in the United States by American Dryer Corporation. This system is distributed in the United States and Mexico by Iowa Techniques, Inc. The new shop owner purchased the Aquatex with the goal of wet cleaning approximately 80 percent of their customers' garments by the end of 1996. During the research period in June the shop wet cleaned 43 percent of the total 1,846 garments cleaned.

University of California-Los Angeles

Pollution Prevention Education and Research Center

Last year, the University of California-Los Angeles (UCLA) through its Pollution Prevention Education and Research Center, initiated a wet cleaning research and demonstration project that parallels the Center for Neighborhood Technology project. It is focused on a private wet cleaning operation, Cleaner by Nature, which includes both a drop-off store, located in Santa Monica, California and a plant, located in Los Angeles. The business opened in February of this year.

UCLA is measuring performance at Cleaner by Nature using test protocols developed in cooperation with CNT. This will provide a broader data set upon which to draw conclusions regarding many aspect of wet cleaning performance. In addition, UCLA will be comparing the environmental impacts such as chemical, energy, and water use, of a wet cleaning shop to a typical dry cleaning shop. UCLA has also developed a partnership with the Korean Youth Community Center which will help disseminate research findings within the Korean dry cleaning community, which is approximately 30 percent of the total industry. An interim report of research findings will be available this month, and the final report is scheduled for release in spring of 1997.

University of Massachusetts-Lowell

Toxics Use Reduction Institute

The Toxics Use Reduction Institute (TURI), located at the University of Massachusetts-Lowell, has been involved in the evaluation of wet cleaning for 4 years. It is developing a training program for the wet cleaning process that will include the development of a training manual. In addition, TURI is working closely with a professional garment cleaning business, Utopia Cleaners, that has recently replaced its dry cleaning machine with wet cleaning equipment. This shop is part of the recently-launched TURI Cleaner Technology Demonstration Sites Program. It will provide further research data on wet cleaning as well as an opportunity for dry cleaners and others to observe the operation.

Conclusion

Many have asked, "Is wet cleaning the answer?" The answer depends on the question. If the question is "is wet cleaning a 100 percent drop-in replacement for traditional dry cleaning solvents?" the answer is no. If the question is "can wet cleaning safety clean a significant percentage of clothes now considered 'dry clean only'?" the answer is yes.

While the CNT research has raised many new questions that will require further research, several conclusions can be made. A significant portion of garments now cleaned in traditional dry cleaning solvents can be safely wet cleaned. Given the variables that effect performance, however, it will be difficult to develop a simple guide, appropriate for use in commercial cleaning shops, indicating which garments can be easily wet cleaned. In both performance and commercial viability wet cleaning has demonstrated enough promise to warrant increased investment in research and development, accessible training programs, and a concerted effort to reshape U. S. care labeling rules.

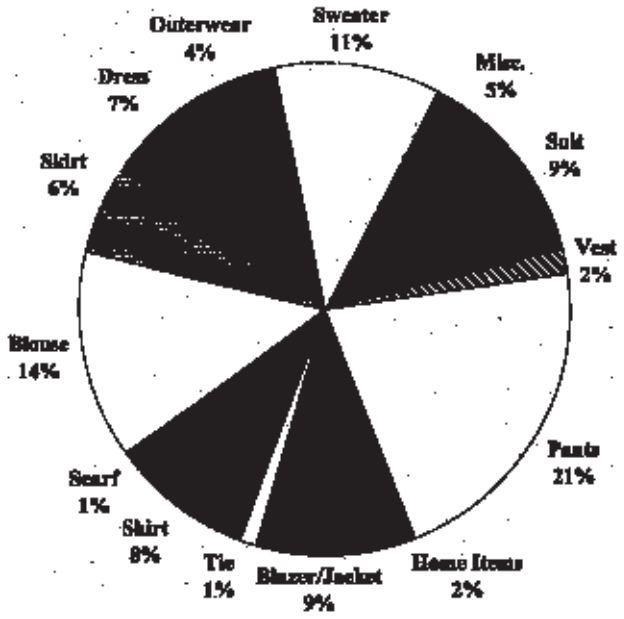
1

Total Garments at the Greener Cleaner
(May 11, 1995 - May 11, 1996)

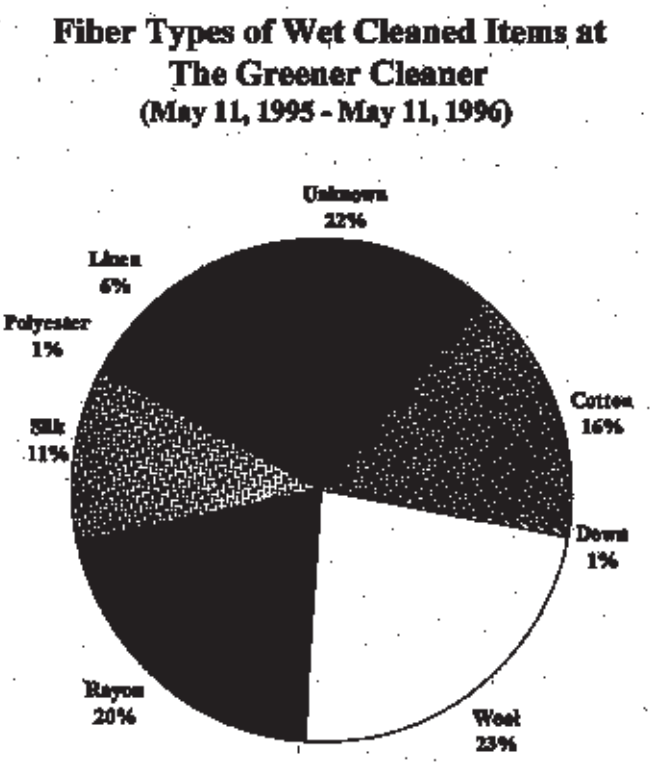
	721	1688	2305	2560	2986	3277	2518	2711	2656	2660	2867	3410	1375	31734
	6	2	6	11	17	13	6	10	10	13	11	13	8	126
	216	316	477	576	721	995	906	896	866	822	950	1039	438	9218
	943	2006	2788	3147	3724	4285	3430	3617	3532	3495	3828	4462	1821	41878
	2	2	4	5	2	3	3	2	2	0	0	4	0	29

2

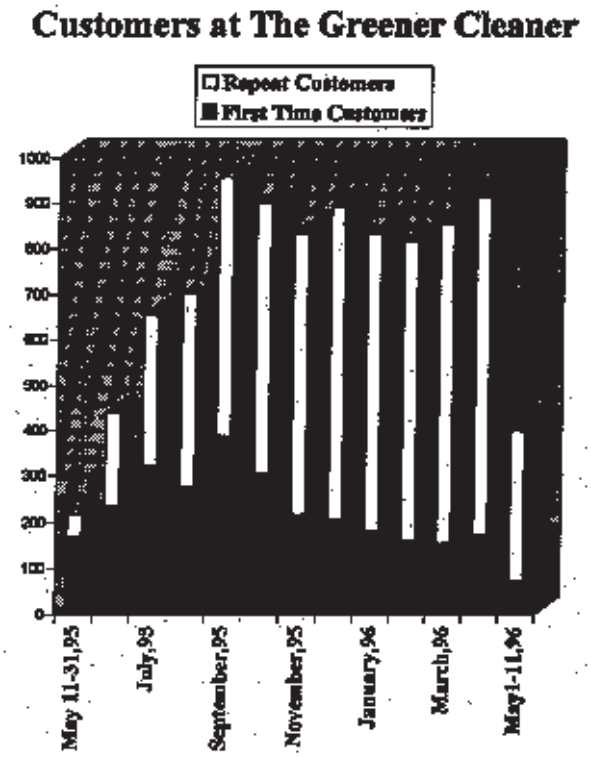
Garment Types of Wet Cleaned Items at The Greener Cleaner
(May 11, 1995 - May 11, 1996)



3

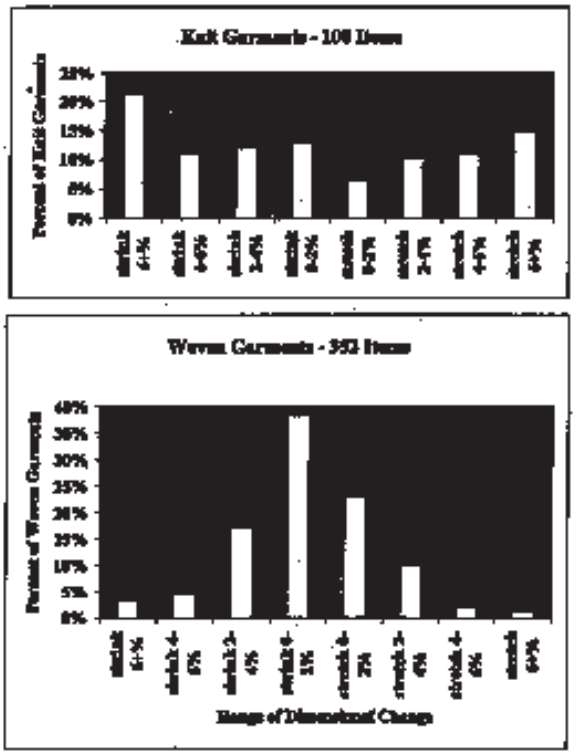

Fiber Types of Wet Cleaned Items at
The Greener Cleaner
(May 11, 1995 - May 11, 1996)
Unknown
22%
Linen
6%
Polyester
1%
Silk
11%
Cotton
16%
Down
1%
Rayon
20%
Wool
23%

4


Customers at The Greener Cleaner
Repeat Customers
First Time Customers
1000
900
800
700
600
500
400
300
200
100
0
May 11-31,95
July,95
September,95
November,95
January,96
March,96
May1-11,96

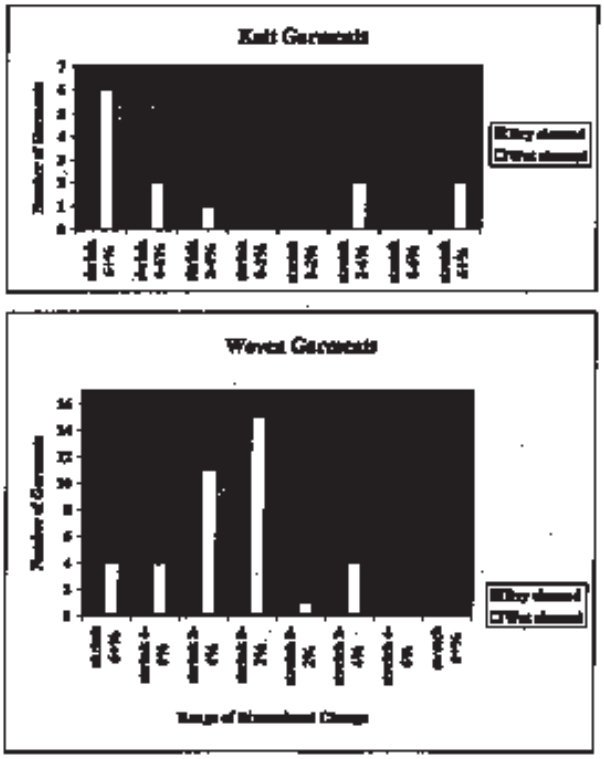
5

Maximum Dimensional Change
for Test Sample Garments
(All Wet Cleaned - 460 Items)



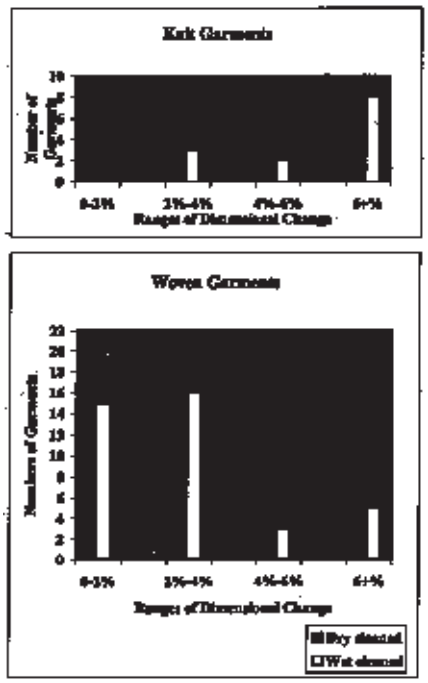
6

Maximum Dimensional Change
for Identical Test Garments
(52 Sets)



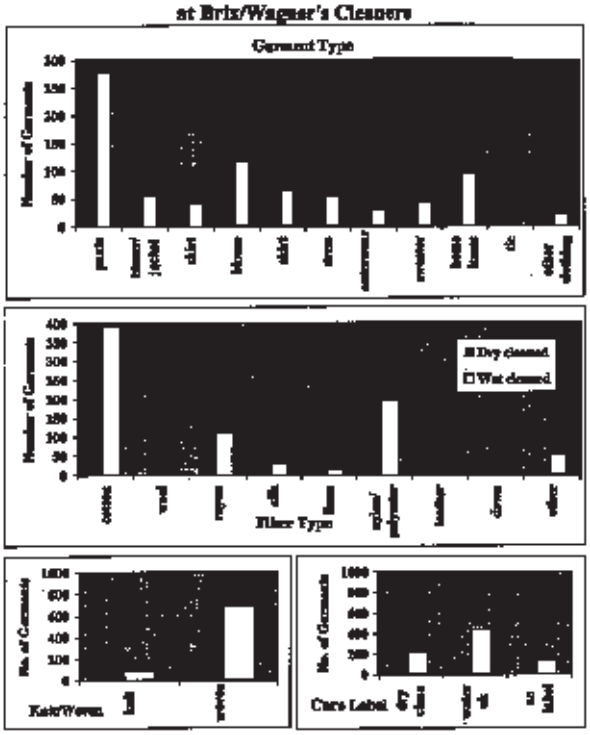
7

Maximum Dimensional Change for Identical Test Garments

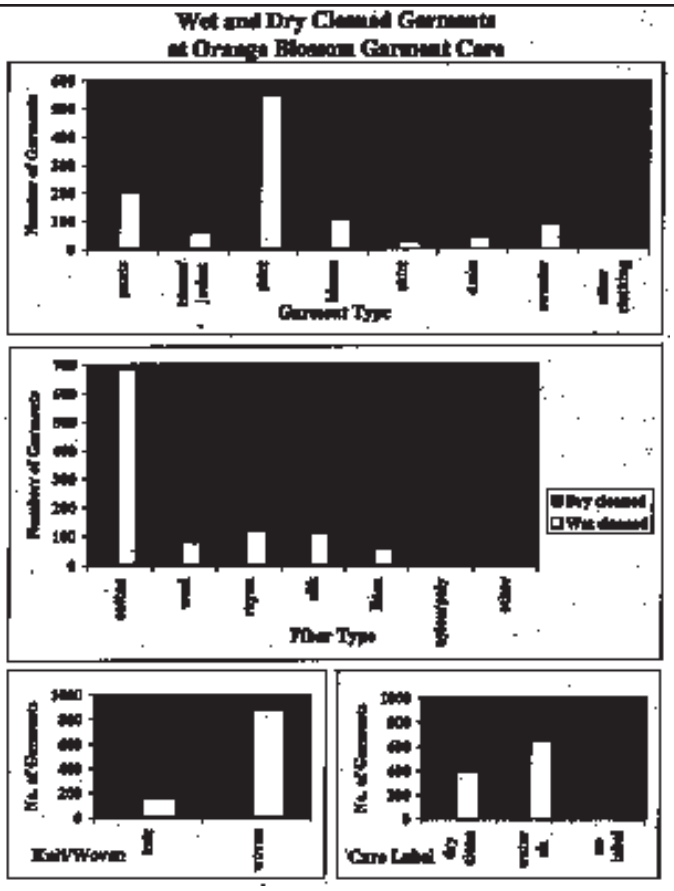


8

Wet and Dry Cleaned Garments at Brix/Wagner's Cleaners



9


Wet and Dry Cleaned Garments
at Orange Blossom Garment Care
Garment Type
Fiber Type
Dry cleaned
Wet cleaned
Knit/Woven
Care Label